Agriculture for Sustainable Development 1(1) 31-33, 2013/Article *ISSN 2347-5358 (Print)*

Agriculture for Sustainable Development

http://www.sustainableagriculture.in

GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN CORIANDER

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Received: 30.07.2013 **Revised accepted: 20.08.2013**

ABSTRACT

The field experiment was carried out during *Rabi* season of the year 2011-2012 on the experimental field of Department of Horticulture, Dr. PDKV, Akola. The study was undertaken on twenty four genotypes of coriander using Randomized Block Design with three replications. The highest genotypic and phenotypic variance was observed for number of umbels per plant, plant height and Days to harvesting. High genotypic and phenotypic coefficient of variance was observed for seed yield. High heritability coupled with high genetic advance as percent of mean was observed for test weight, plant height and number of seed per umbel indicating the important of additive gene effects for these traits. Therefore, greater emphasis should be given on these characters while selecting for higher yield and related traits.

Keywords:
Coriander, Genetic variability, Heritability, Genetic advance.

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an important seed spices crop of family Apiaceae (Umbelliferae) and posses 2^n=22 chromosomes with cross-pollination as mode of reproduction. Western Europe and Asia are considered to be the centre of origin of this crop (Gal, *et al*., 2010). The area and production of coriander during 2009-2010 in India were 107.54 thousand ha. 385.33 thousand million tonnes respectively (Anonyms, 2010). To make this crop more productive and resistant to diseases and insect-pest, breeders have to launch an intensive breeding programme for releasing array of variability. Development of high yielding cultivars requires knowledge of the existing genetic variation and also the extent of association among yield contributing characters.

The observed variability is a combined estimate of genetic and environmental causes of which only the former one is heritable. However, the estimate of heritability alone does not provide an idea of the expected gain in the next generation but it has to be considered in conjunction with genetic advance. Keeping this in view, the present investigation was made to explore the genetic variability, by determining the magnitude of genetic coefficient of variation, heritability estimates and expected genetic advance of different biometric traits effects in 24 coriander genotypes.

MATERIALS AND METHODS

The experimental material comprised twenty four diverse genotypes (RCr-20, RCr-41, RCr-435, RCr-436, RCr-684, GCr-1, GCr-2, Co-1, Co-2, Co-3, Co-4, JD-1, NRCSS-ACr-1, Azad Dhania-1, Rajendra Swathi, Swathi, Sudha, Sindhu, Sadhana, Pant Haritma, Hissar Sugandh, Hissar Anand, Hissar Surbhi and Akola Local and were sown during rabi 2011-2012 under the randomized block design with three replication at Main Garden Department of Horticulture, Dr .Panjabrao Deshmukh Krishi Vidyapeeth. Akola. The experimental materials (Genotypes of coriander) were obtained from the National Research Center of Seed spices Ajmer, Rajasthan and Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Akola, Maharashtra. The seeds of different genotypes were sown on 24 October at Main Garden Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Akola. The recommended dose of manures and fertilizer were applied at the time of field preparation. Akola is situated in subtropical region between 22° 42' N latitude and 77° 02' longitudes at an altitude of 307.42' above the mean sea level. Row to row and plant to plant spacing were maintained at 30 cm and 10 cm respectively. All the agronomic package of practices was adapted to grow a healthy crop. In each replication five plants randomly selected were marked for observation. Observations were recorded for twelve characters viz., plant height (cm), number of primary branches per plant, number of secondary branches per plant, leaf area (cm^2), days to 50 percent flowering, days to harvesting, number of umbels per plant, number of umbellets per umbel, number of seeds per umbel, test weight (g), seed yield per plant (g), seed yield per plot (kg), seed yield per ha.(q), chlorophyll content (mg/g). The recorded data were analysis as suggested by Panse and Sukhatm, (1989). The genotypic and phenotypic coefficient of variance was calculated as per formula suggested by

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Burton,(1952), Henson (1956) and Johnson (1955) for heritability and genetic advance. (Al-Jibouri *et al*., (1958).

RESULTS AND DISCUSSION

Analysis of variance revealed significant differences among genotypes for all traits studied indicating presence of significant variability in the materials (Table 1). The range of variance was high for days to harvesting (91.66-134.66) followed by plant height (54.60-121.66) and days to 50% flowering (41.33-70.00).

In general the phenotypic variance and phenotypic coefficient of variance were higher than the respective genotypic variance and genotypic coefficient of variance for all the traits (Table 2.) indicating a considerable influence of environmental on their expression. In the present investigation, genotypic were found to process high to moderate phenotypic variance for various characters as revealed by phenotypic coefficient of variance. The phenotypic coefficient of variance varied from Days to harvesting (11.06) to seed yield per plot (29.50) similar result have been reported by Mandal and Hazara. (1989) The PCV expressed in terms of percentage were comparatively high for seed yield per plot followed by seed yield per plant, seed yield/ha, no. of umballete per umbel, primary and secondary branches, no of seed per umbel, leaf area and test weight. As the estimates of phenotypic variability cannot differentiate between the effect of genetic and environmental effect, So the study of genetic variability is effective in partitioning out the real genetically difference. Higher the GCV, more the chance of improvement in that characters. In the present investigation GCV were comparatively high for seed yield per plot (kg) followed by seed yield per pant, seed yield/ha, primary and secondary branches, leaf area, no of umbels per plant, no of seed per umbel and test weight. The GCV is less than the corresponding PCV, indicating the role of environment in the expressive of the traits under observation. The different between GCV and PCV were more in case of primary branches per plant, no. of umballets per umbel and days to harvesting. The large difference between GCV and PCV indicated that environment effect to a large extent influenced the traits. The characters having high GCV possessed better potential for further grain and improvement (Burton).

Burton and De vane has suggested that GCV together with heritability estimate would give best option expected for selection. Heritability estimates were high for test weight, plant height, no of seed per umbel and chlorophyll content. High heritability for the characters controlled by polygene might be use full to plant for making effective selection (Johanson *et al.,* 1955) reported that the heritability estimates along with genetic advance is more useful than the resultant effect for selecting the best genotypes as it suggest the presence of additive gene effects. High estimate of genetic advance were recorded for seed yield/plot followed by seed yield/plant, seed yield/ha, no of umbel/plant, secondary branches, leaf area and no of seed/umbel. The information on heritability along may be misleading, when used in combination with genetic advance the utility of heritability estimate increases. In the present study, high genetic advance coupled with high heritability was observed for seed yield per plant and no of umbels per plant. It indicated that additive gene effects were more important for these traits. Therefore, improvement in there traits would be more effectively done through selection in the present materials. Depending upon the variability, heritability and genetic advance estimates, it could be predicted that improvement by direct selection was possible in coriander for traits like seed yield per plot, no of umbel per plant days to harvesting and no of seed per umbel. Therefore, these characters should be considered while making selection for yield improvement in coriander. There finding are in line with Sanker and Khader (1991).

Table 1 Analysis of variance for different quantitative character in coriander.

		Mean Square													
Source	D.F.	Plant height (cm)	Primary branches / plant	Secondary Branches / plant	Leaf area (cm^2)	Days to 50 % flowering	No of umbels per plant	No. of umballete umbel	No. of seed/ mbel	Test weight (g)	Days to harvesting	seed yield per plant (g)	seed yield Per plot (kg)	seed yield/ ha (q)	Chlorophyll content
Replications	2	2.37	0.20	0.73	0.28	1.38	6.21	0.03	0.31	0.11	0.68	0.25	0.07	3.94	0.49
Treatments	23	585.66**	5.80**	38.98**	40.82**	177.20**	623.24**	1.80**	112.67**	22.99**	456.05**	20.34**	0.74**	225.10**	78.90**
Error	46	1.112	0.46	0.43	0.32	3.50	4.30	0.06	0.32	0.034	2.82	0.19	0.08	2.12	0.46

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Table 2 Range, mean, component of variance, coefficient of variance, heritability, genetic advance and genetic advance as percentage of mean for different quantitative traits in coriander.

Characters	Range		Mean	Variance		Coefficient of variance		Heritability %	Genetic advance as % of means
	Min.	Maxi.		Genotypical	Phenotypical	Genotypical	Phenotypical		
Plant height (cm)	54.60	121.66	81.33	194.85	195.96	17.16	17.21	99.40	35.25
Primary branches/ plant	4.46	11.53	6.14	1.78	2.24	21.73	24.39	79.40	39.89
Secondary branches/ plant	7.93	25.40	14.17	12.85	13.28	25.29	25.71	96.80	51.26
Leaf area (cm^2)	11.24	25.35	14.99	13.49	13.82	24.49	24.78	97.70	49.86
Days to 50 % flowering	41.33	70.00	54.55	57.90	61.40	13.94	14.36	94.30	27.90
No of umbels per plant	33.33	76.93	55.24	206.31	210.61	26.00	26.27	98.00	53.01
No. of umballate/umbel	4.13	6.80	5.30	0.58	153.90	10.96	13.27	90.20	28.13
No. of seed per umbel	18.36	41.90	25.22	37.45	37.77	24.26	24.37	99.10	49.76
Test weight(g)(1000seed)	8.20	18.73	13.56	7.65	7.68	20.39	20.44	99.50	41.91
Days to harvesting	91.66	134.66	112.13	151.07	0.64	14.37	11.06	98.20	22.37
Seed yield per plant(g)	4.62	13.54	9.03	6.71	6.90	28.68	29.08	97.20	58.26
Seed yield Per plot(kg)	0.27	0.81	0.54	0.02	0.02	29.03	29.50	96.80	58.84
Seed yield Per ha(q)	16.20	45.11	30.16	74.32	76.45	28.58	28.98	97.20	58.05
Chlorophyll content	30.03	49.05	38.84	26.15	26.61	13.16	15.13	98.30	26.87

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